

REMARKS

Claims 1-3, 5, and 7-28 are pending and claims 1-3 and 7-13 are currently under examination. Claims 5 and 14-28 are withdrawn. Claims 1-3 have been amended by the present communication and no new matter is added.

Priority

The Examiner asserts that the claimed invention does not receive benefit to the February 13, 2004 or February 27, 2004 provisional applications. Applicant respectfully traverse this assertion.

In particular, the Examiner states that "it is noted that not all of the SNPs provided in Table 2, as now claimed, are presented in the provisional applications." (see lines 12-13, page 3 of the Office Action dated November 12, 2010).

Without acquiescing to the Examiner's assertion, claim 1 has been amended to recite SEQ ID NOs: 1-9, 27, 29-31, 40-43, and 45-48. Applicant submits that SEQ ID NOs: 1-9, 42-43 and 46-48 are disclosed in both provisional applications: 60/544,788 filed February 13, 2004, and 60/548,370 filed February 27, 2004. In addition, SEQ ID NOs: 27, 29-31, 40-41, and 45 are disclosed in the Frudakis 2003 article (Frudakis *et al.*, 2003, *Genetics* 165:2071-2083), which is incorporated by reference in the provisional application 60/548,370 filed February 27, 2004 (see for example paragraph [0049] on page 17 of 60/548,370). Accordingly, Applicant respectfully submit that the amended claim 1 is entitled to at least the priority of the provisional application 60/548,370 filed February 27, 2004.

As to the Examiner's assertion that no guidance how to infer natural eye color of a human based upon these SNPs, Applicant submits that Example 2 and Table 2 of the provisional applications 60/548,370 filed February 27, 2004 disclose a set of 35 SNPs. This same set of 35 SNPs is also disclosed in the provisional application 60/544,788 filed February 13, 2004. Applicant submits that the disclosure of a set of 30-40 SNPs associated with human eye color can provide sufficient guidance to those skilled in the art, because

Applicant starts from a total of 10,000 SNPs (for example, see paragraph [0051] on page 21 of the specification), narrows down to about 130 SNPs, and then further narrows down to about 27-35 SNPs (for example, see paragraphs [0051]-[0054] on pages 21-22 of the specification). Accordingly, the specification provides a major groundbreaking work for inferring human eye colors with a set of 30-40 SNPs by ruling out more than 9,900 SNPs. Thus, Applicant submits that both provisional applications provide sufficient guidance and the claimed invention is entitled to at least the benefit of the provisional application 60/548,370 filed February 27, 2004.

Claim Objections

Claims 2-3 are objected for failing to further limit the subject matter of a previous claim. Without acquiescing to the Examiner's assertions, claims 2-3 have been amended to further limit claim 1. The currently amended claim 2 recites SNPs of the OCA2 gene. The currently amended claim 3 recites SNPs disclosed in tables of both provisional applications. Accordingly, withdrawal of the claim objections is respectfully requested.

Claim Rejections – 35 USC § 112 - First Paragraph

Claims 1-3, 7-13 are rejected under 35 U.S. C. 112, first paragraph, for lack of enablement. Applicant respectfully traverse this rejection.

First, the Examiner states the following for unpredictability:

“While the state of the art and level of skill in the are with regard to the detection of any known polymorphic allele is high, the level of unpredictability in associating any particular allele with a specific phenotype is even higher. The high level of unpredictability is demonstrated by the prior art, the post filing art, and the instant specification.”

Lines 3-7, page 7 of the Office Action dated November 12, 2010

Applicant submits that a total of 10, 000 SNPs have been narrowed down to a set of 30-40 SNPs for inferring human eye colors according to the claimed invention using statistic methodology (for example, see paragraphs [0051]-[0054] on pages 21-22 of the specification). Thus, the resulting highly relevant 30-40 SNPs are statistically significant for

inferring human eye colors. Although there is a high level of unpredictability generally in the field, Applicant has improved predictability using statistical approaches and rule out more than 9,900 SNPs for inferring human eye colors. For example, a ratio of 10,000 SNPs/40 SNPs equals to a 250-fold improvement, and Applicant submits that the predictability of the claimed invention is much higher than asserted by the Examiner.

Second, the Examiner states the following for guidance of experimentation:

“Moreover, it is unclear how the skilled artisan would infer eye color in the event ALL SNPs “were not correct”. For example, if nucleotide 68 of SEQ ID NO:3 were to indicate a darker eye shade and nucleotide 171 of SEQ ID NO:4 were to indicate a lighter eye shade. There would be no reason inference to be made. Stated another way, it is unpredictable how one would infer natural eye color in half of the SNPs indicated dark eye color and the other half of the SNPs indicated light eye color.

Claim 1 has been amended to state that “a C residue nucleotide 360 of SEQ ID NO: 10 indicates an increased likelihood of a darker eye shade”. However, SEQ ID NO: 10 does not appear to be in Table 2. Thus it is unpredictable how to use this information since the claims does not require identifying the SNP of SEQ ID NO:10.

Furthermore, it is unclear how one would infer natural eye color. Rebbeck teaches 7 categories of eye colors, namely blue, gray, green, hazel, light brown, dark and black. The specification only analyzes two categories: dark or light.

This would require significant inventive effort, with each of the many intervening steps, upon effective reduction to practice, not providing any guarantee of success in the succeeding steps.”

Lines 7-22, page 10 of Office Action dated November 12, 2010

The Federal Circuit has held that “[t]he enablement requirement is met if the description enables any mode of making and using the invention.” *Johns Hopkins University v. CellPro, Inc.*, 152 F.3d 1342, 1361 (Fed. Cir. 1998) (citing *Engel Indus., Inc. V. Lockformer Co.*, 946 F.2d 1528, 1533 (Fed. Cir. 1991); *see also Invitrogen Corp. v. Clontech Laboratories, Inc.*, 429 F.3d 1052, 1071 (Fed. Cir. 2005). Thus, Applicant submits that the claimed invention is fully enabled because the specification provides sufficient guidance with significant experimental procedures and data.

Further, the Federal Circuit has held that routine experimentation does not constitute undue experimentation, stating that:

“The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed.” (citation omitted).

PPG Indus., Inc. v. Guardian Indus. Corp., 75 F.3d 1558, 1564 (Fed. Cir. 1996)

The Federal Circuit has elaborated on the gap-filling principle, stating:

“That is not to say that the specification itself must necessarily describe how to make and use every possible variant of the claimed invention, for the artisan’s knowledge of the prior art and routine experimentation can often fill gaps, interpolate between embodiments, and perhaps even extrapolate beyond the disclosed embodiments, depending upon the predictability of the art.”

AK Steel Co. v. Sollac, 344 F.3d 1234, 1244.

Applicant respectfully traverse the Examiner’s assertions. Applicant wishes to clarify that obtaining the SNPs alone does not predict human eye colors. The obtained SNPs are compared to known sequences where eye colors are previously known. For example, paragraph [0059] on page 26 of the specification states the following:

[0059] The iris color of a subject can be predicted from a nucleic acid sample by determining the genotype of the sample with respect to SNPs as shown in Table 2 (e.g., with one or more of the SNPs of SEQ ID NOS: 1 to 7); comparing the genotype against those for known subjects in a database (*i.e.*, subjects for whom eye color has been associated with nucleotide occurrence(s) of the SNPs; and identifying known subjects whose genotypes match the unknown sample. The iris colors of the known subjects thus provide a guide.

Accordingly, Applicant submits that human sequences of selected SNPs do not occur randomly but fall into patterns due to heritage. There should not be a “fictional combination” of selected SNPs as asserted by the Examiner such as “all SNPs were not correct.” Applicant submits that most of human sequences of selected SNPs have relatively common patterns for inferring human eye colors, and that is the reason why the method of the claimed invention is robust for a majority of cases tested. Thus, the specification provides sufficient guidance and only routine experimentation is needed to carry out the claimed invention.

Further, reference to SEQ ID NO: 10 has been deleted from claim 1 without prejudice, thus rendering rejection against SEQ ID NO: 10 moot. Applicant also wishes to clarify that the disclosure of the specification is not limited to two categories of human eye colors as asserted by the Examiner. In fact, various classification systems can work well based on the disclosure of the specification. For example, paragraphs [0064]-[0066] on page 28 of the specification provides a classification model with five classes, where human eye colors are classified from class 1 to class 5. Applicant submits that the claimed invention recites two categories of human eye colors for accommodating self-reporting colors in the samples tested. For example, a particular individual may have scientifically green eyes but prefer to self-report as blue eyes. Thus, categorizing this individual as a light eye color can avoid such dilemma.

Third, the Examiner states that Table 2 does not provide any data for human eye colors, stating that:

“The response further relies upon Table 2, however, Table 2 does not appear to provide any data of eye shade/alleles. Table 3 provides 10 SNPs and their delta and gene and allele/eye shade, but for the reasons discussed above, there is no significant association that the skilled artisan may reasonably infer natural eye color. It is unclear what the ordinary artisan would infer if SEQ ID NO: 3 was a T and SEQ ID NO: 4 was a G.

The response relies upon Exhibit A, but as discussed above, Exhibit A fails to address each of the SNPs in Table 2 and fails to provide how to infer based upon the SNPs provided in the reference.

Thus for the reasons above and those already of record, the rejection is maintained.”

Lines 9-19, page 12 of the Office Action dated November 12, 2010

Applicant wishes to clarify again that the sequences of SNPs listed in Table 2 or Table 3 alone do not infer human eye colors. As discussed above, the inferring process relies on the associations between patterns of SNPs and samples of known eye colors. The amended claim 1 has a three-step process and the identifying SNPs step alone does not automatically infer an individual's eye color because the comparing step is needed to examine SNP patterns with samples of known eye colors. Accordingly, the specification provides sufficient guidance to those skilled in the art regardless the presence or absence of eye color data in Tables 2 and 3.

In summary, Applicant submits that the claimed invention is fully enabled because no undue experimentation is needed to practice the claimed invention. Applicant has accomplished the major groundbreaking work to rule out more than 9,900 SNPs and narrows down to a set of 30-40 statistically significant SNPs for inferring eye colors. The specification has provided sufficient guidance for those skilled in the art, because more than 9,900 SNPs have been ruled out and only routine experimentation is needed to carry out the claimed invention. Thus, a withdrawal of the lack of enablement rejection is respectfully requested.

Claim Rejections – 35 USC § 112 – Second Paragraph

Claims 1-3, 7-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In particular, the Examiner states the following:

“A) The claims are drawn to a method for inferring natural eye color in a human subject by detecting the SNPs in Table 2. The final process step is merely drawn to comparing the identified nucleotide with known nucleotide occurrences. It is unclear whether the claims are drawn to inferring natural eye color would be complete the claim. The metes and bounds of the claimed invention are unclear.”

Lines 8-14, page 13 of Office Action dated November 12, 2010

To expedite prosecution of the subject application, claim 1 has been amended to recite step (c) as suggested by the Examiner. Accordingly, the currently amended claim 1 has three steps.

In addition, the Examiner made the following comment regarding SEQ ID NO: 10:

“B) Claim 1 has been amended to state that “a C residue at nucleotide 360 of SEQ ID NO: 10 indicates an increased likelihood of a darker eye shade”. However SEQ ID NO: 10 does not appear to be in Table 2. It is unclear how this limitation further limits the claims. It is unclear how the information will be used to infer eye color since SEQ ID NO: 10 is not identified, as it is not in Table 2.”

Lines 15-19, page 13 of Office Action dated November 12, 2010

To expedite prosecution of the subject application, claim 1 has been amended to delete the reference to SEQ ID NO: 10 without prejudice, rendering the rejection against SEQ ID NO: 10 moot.

Accordingly, withdrawal of the indefiniteness rejections is respectfully requested.

In the Application of:
Tony N. Frudakis
Application No.: 10/589,291
Filed: June 4, 2007
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PATENT
Attorney Docket No.: DNA1180-2

CONCLUSION

In view of the foregoing amendments and the remarks, it is submitted that the claims are in condition for allowance, and a notice to that effect is respectfully requested. The Examiner is invited to contact Applicant's undersigned representative if there are any questions relating to this case.

The Commissioner is hereby authorized to charge the amount of \$180.00 as payment for the Information Disclosure Statement fee to Deposit Account No.: 07-1896. No other fee is deemed necessary with the filing of these papers. However, in any event that any additional fee is due, the Commissioner is hereby authorized to charge any fees required by this submission, or make any credits or overpayments, to Deposit Account No. 07-1896 referencing the above-identified attorney docket number.

Respectfully submitted,

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Lisa A. Haile, J.D., Ph.D.
Registration No.: 38,347
Telephone: (858) 677-1456
Facsimile: (858) 677-1465

DLA PIPER LLP (US)
4365 Executive Drive, Suite 1100
San Diego, California 92121-2133
USPTO Customer No.: 28213